

## 299-W19-73 (A7773) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-W19-73 (A7773)		<b>Site:</b> 216-U-2 Crib			
<b>Coordinates (WA St Plane)</b>		<b>GWL<sup>1</sup> (ft):</b> None		<b>GWL Date:</b> 08/22/05	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>Elevation (TOC)</b>	<b>Total Depth (ft)</b>	<b>Type</b>
135001.833	567242.919	03/51	Not available	75	Cable

### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	0.6	10 3/4	10 1/4	1/4	0.6	4
Welded steel	0	8 5/8	8	5/16	0	75

### Borehole Notes:

Casing diameter and stickup measurements for the 1-in. casing were acquired using a caliper and steel tape. The dimensions for the 8-in. casing are estimated. Measurements are rounded to the nearest 1/16 inch. Logging data acquisition is referenced to the top of casing (TOC).

### Spectral Gamma Logging System (SGLS) Equipment Information:

<b>Logging System:</b>	Gamma 1E	<b>Type:</b>	SGLS (35%) SN: 34TP40587A
<b>Effective Calibration Date:</b>	03/04/05	<b>Calibration Reference:</b>	DOE/EM-GJ864-2005
		<b>Logging Procedure:</b>	MAC-HGLP 1.6.5, Rev. 0

### High Rate Logging System (HRLS) Equipment Information:

<b>Logging System:</b>	Gamma 1C	<b>Type:</b>	HRLS SN: 39-A314
<b>Effective Calibration Date:</b>	04/06/05	<b>Calibration Reference:</b>	DOE/EM-GJ865-2005
		<b>Logging Procedure:</b>	MAC-HGLP 1.6.5, Rev. 0

### Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	
Date	08/22/05	08/22/05	08/22/05	08/22/05	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	1.0	18.0	43.0	45.0	
Finish Depth (ft)	18.0	43.0	75.0	55.0	
Count Time (sec)	100	20	100	100	

Log Run	1	2	3	4 Repeat	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A <sup>2</sup>	N/A	N/A	N/A	
Pre-Verification	AE098CAB	AE098CAB	AE098CAB	AE098CAB	
Start File	AE098000	AE098018	AE098044	AE098077	
Finish File	AE089017	AE098043	AE098076	AE098087	
Post-Verification	AE098CAA	AE098CAA	AE098CAA	AE098CAA	
Depth Return Error (in.)	N/A	N/A	N/A	N/A	
Comments	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment	

### **High Rate Logging System (HRLS) Log Run Information:**

Log Run	5	6	7		
Date	08/22/05	08/23/05	08/24/05		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	18.0	22.0	36.0		
Finish Depth (ft)	25.0	42.0	42.0		
Count Time (sec)	300	300	300		
Live/Real	R	R	R		
Shield (Y/N)	N	Y	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	AC137CAB	AC138CAB	AC139CAB		
Start File	AC137000	AC138000	AC139000		
Finish File	AC137007	AC138020	AC139006		
Post-Verification	*None	AC138CAA	**None		
Depth Return Error (in.)	0	0	0		
Comments	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment		

### **Logging Operation Notes:**

Logging was conducted with a centralizer on each sonde. An internal shield was used for the HRLS in the depth interval between 22 and 42 ft at the locations of highest gamma flux. Measurements are referenced to TOC. Repeat sections were collected in this borehole to evaluate the logging system's performance.

### **Analysis Notes:**

<b>Analyst:</b>	Henwood	<b>Date:</b>	09/01/05	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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Pre-run and post-run verifications for the logging systems were performed before and after each day's data acquisition. The high rate logging system ceased operating after file -007 on August 22, probably due to entering a high activity zone at 25 ft. Consequently, no post verification measurement was acquired. The system was operating correctly the next day as determined by the pre-verification measurement. On August 24, a Hanford emergency unrelated to the logging operation caused the logging engineer to terminate logging to evacuate the area. A post-verification measurement was not acquired. Acceptance criteria were met for all systems as determined from all the available pre- and -post verification measurements.

A casing correction for 5/16-in.-thick casing (8-in. casing) was applied to the spectral log data (SGLS and HRLS) below 4 ft. A combined correction for 0.5625-in. ( $0.25 + 0.3125$  for the 10- and 8-in. casing) thick casing was applied between the ground surface and 4 ft.

SGLS and HRLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL worksheet templates identified as G1Emar05.xls and G1Capr05.xls for the HRLS using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations. Dead time corrections are applied where dead times exceed approximately 11 percent. Where SGLS dead time exceeds 40 percent, HRLS data are substituted. Correction for water was not needed in this borehole.

### **Log Plot Notes:**

Separate log plots are provided for the man-made radionuclides ( $^{137}\text{Cs}$ ,  $^{60}\text{Co}$ ,  $^{108\text{m}}\text{Ag}$ , and processed uranium [ $^{235}\text{U}$  and  $^{238}\text{U}$ ]) detected in the borehole, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ ,  $^{232}\text{Th}$  [KUT]), a combination of man-made, KUT, and dead time, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. Repeat log sections are also included where appropriate.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was detected from the ground surface to 68 ft. A zone of very high  $^{137}\text{Cs}$  exists between approximately 18 and 42 ft. The maximum concentration was approximately 4 million pCi/g at 27 ft.

$^{60}\text{Co}$  was detected from 43 to 53 ft. The maximum concentration was approximately 0.2 pCi/g at 50 ft. It is probable  $^{60}\text{Co}$  also exists in the high rate interval from 18 to 42 ft at higher concentrations.

Evidence of processed uranium exists from 42 to 72 ft. Although no detections of processed uranium exist in the high activity zone between 18 and 42 ft, it is most likely present. The MDLs for  $^{238}\text{U}$  and  $^{235}\text{U}$  in the high activity zone, as determined from the SGLS, were approximately 1,000 pCi/g. The maximum concentrations determined from the SGLS occurred at the lower margin of the high activity zone at approximately 42 ft. The measured concentrations for  $^{238}\text{U}$  and  $^{235}\text{U}$  were approximately 80 and 20 pCi/g, respectively.

Unusual gamma lines encountered in borehole 299-W19-73 have been identified as  $^{108\text{m}}\text{Ag}$  (half life = 418 years). Three gamma lines at 433.93, 614.28, and 722.94 keV were present, and concentrations appear to be consistent at approximately 1.5 pCi/g. The  $^{108\text{m}}\text{Ag}$  occurred from 48 to 51 ft, below a high-rate interval from 18 to 42 ft, where  $^{137}\text{Cs}$  concentrations exceeded 4 million pCi/g. The source of the  $^{108\text{m}}\text{Ag}$  is not known; this radionuclide has apparently not been previously detected in spectral gamma logs.

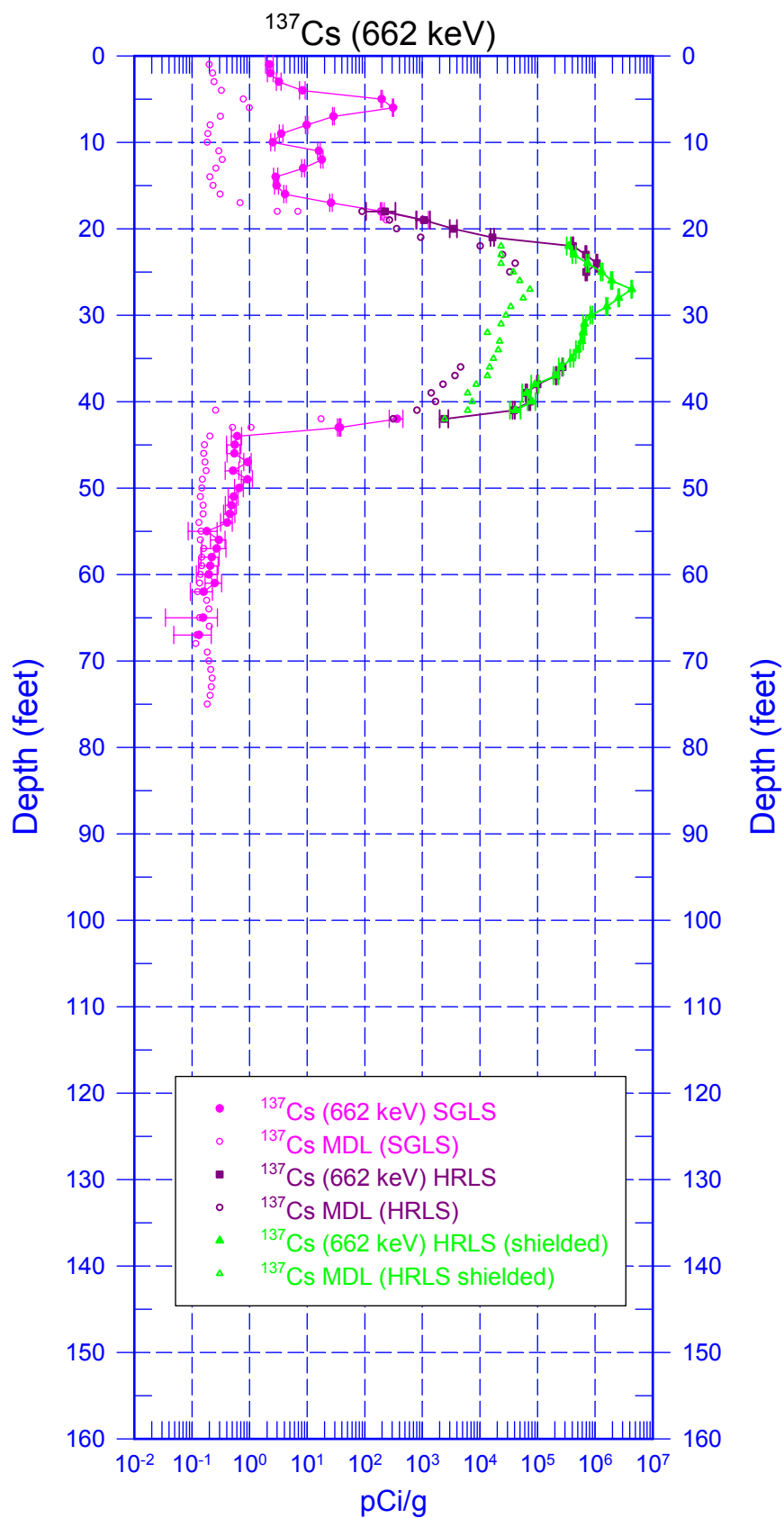
The repeat sections for the SGLS indicate good agreement for the naturally occurring and man-made radionuclides.

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<sup>1</sup> GWL – groundwater level

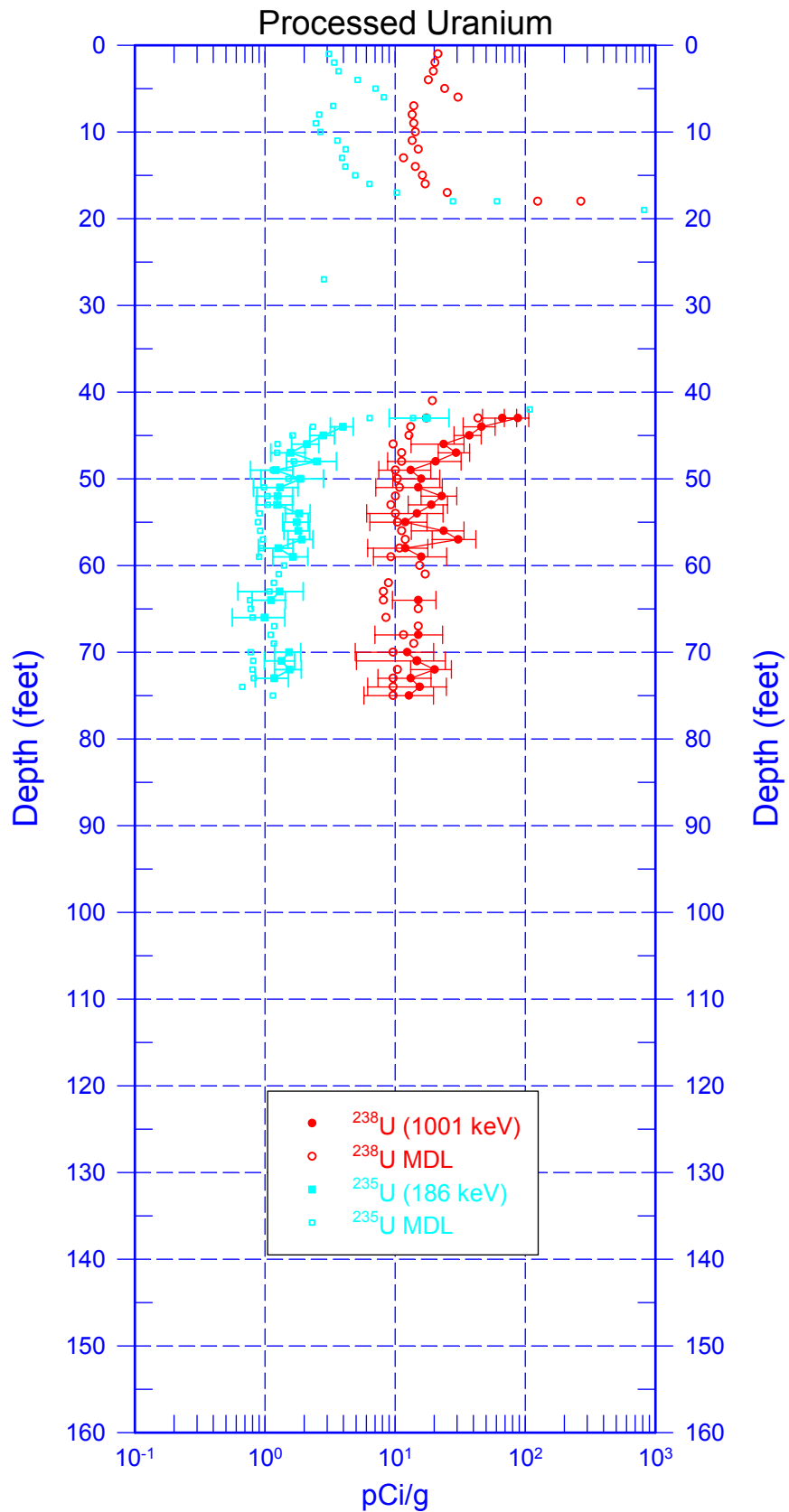
<sup>2</sup> N/A – not applicable

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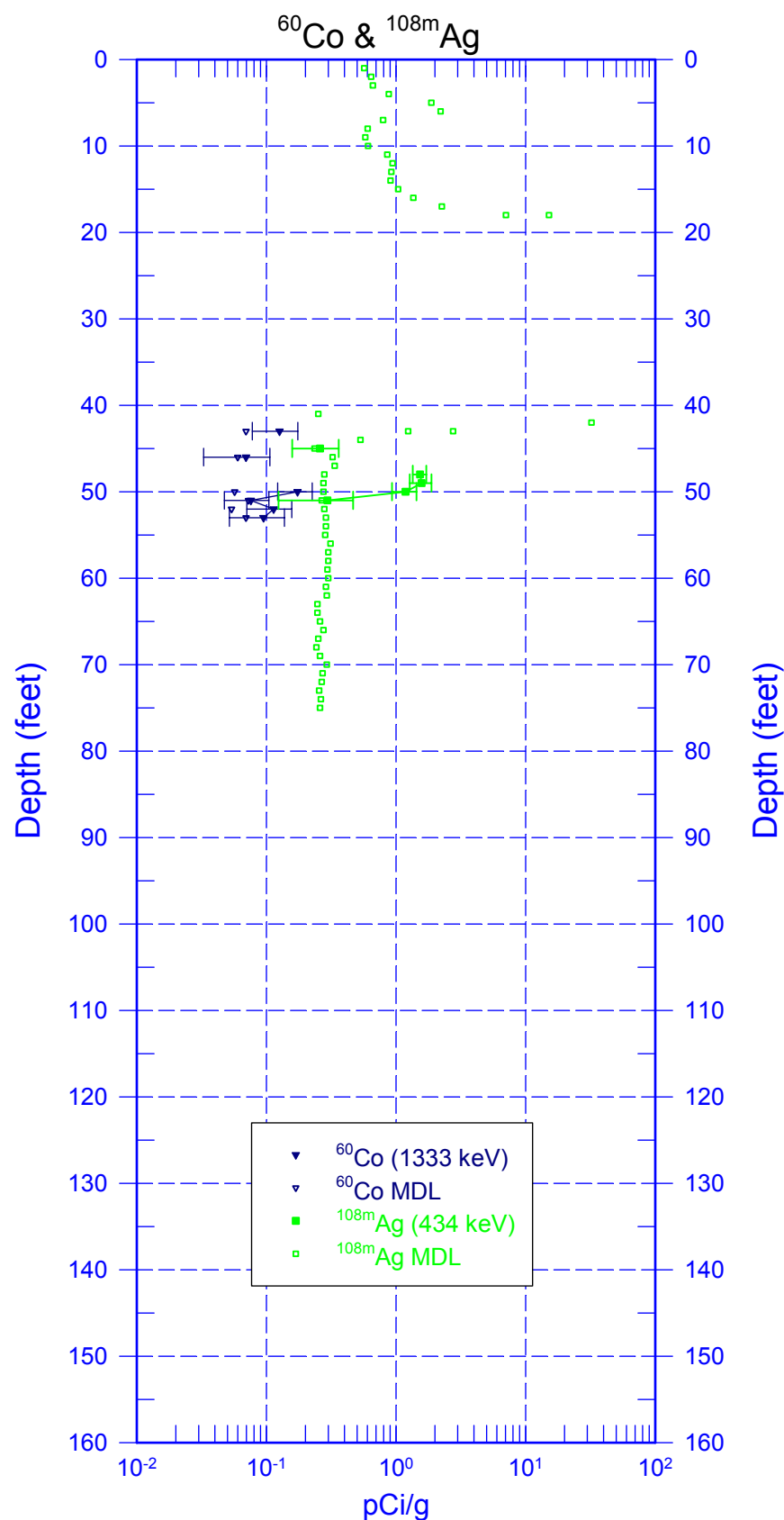
Zero Reference = Top of Casing

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Zero Reference = Top of Casing

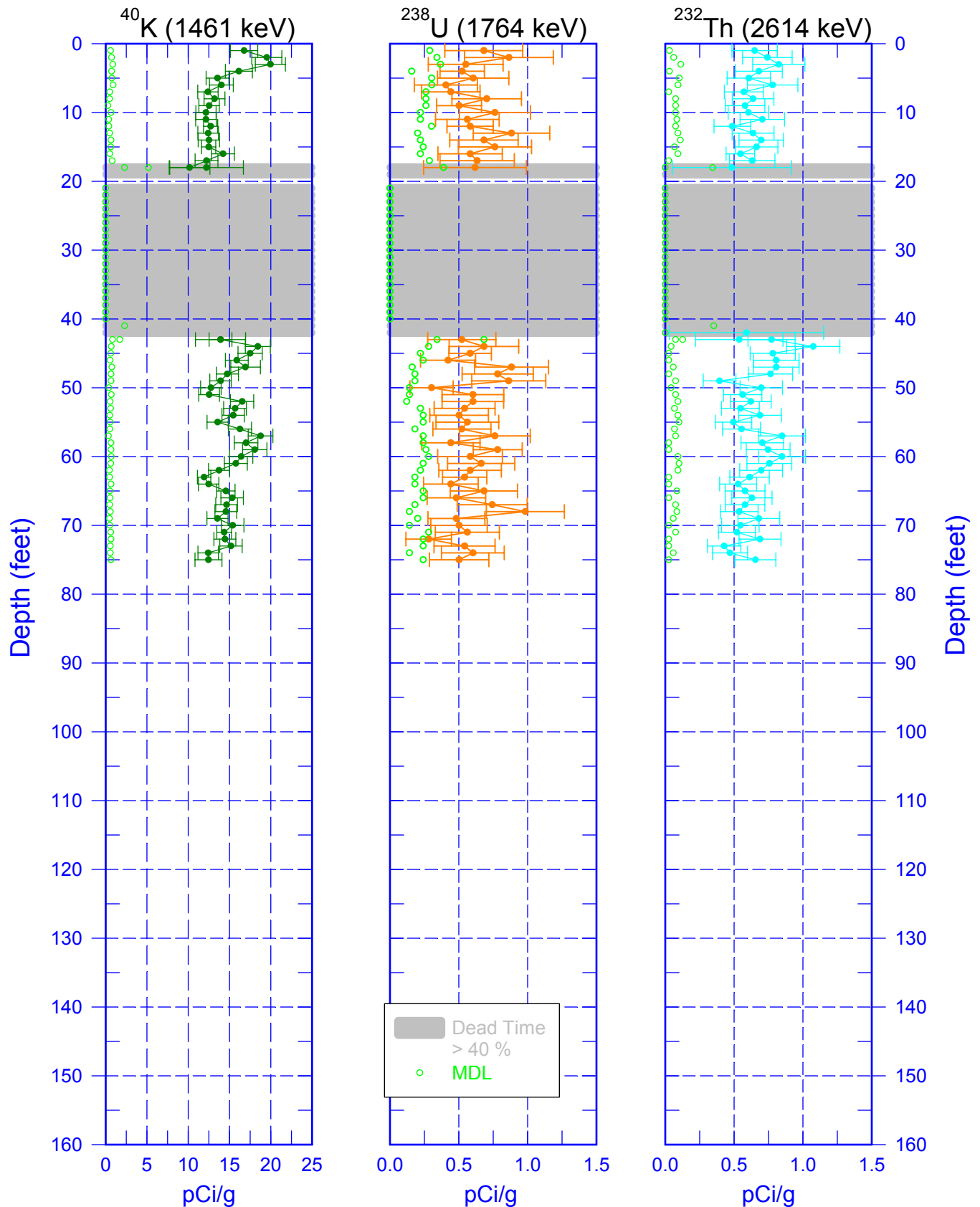
# 299-W19-73 (A7773)



Zero Reference = Top of Casing

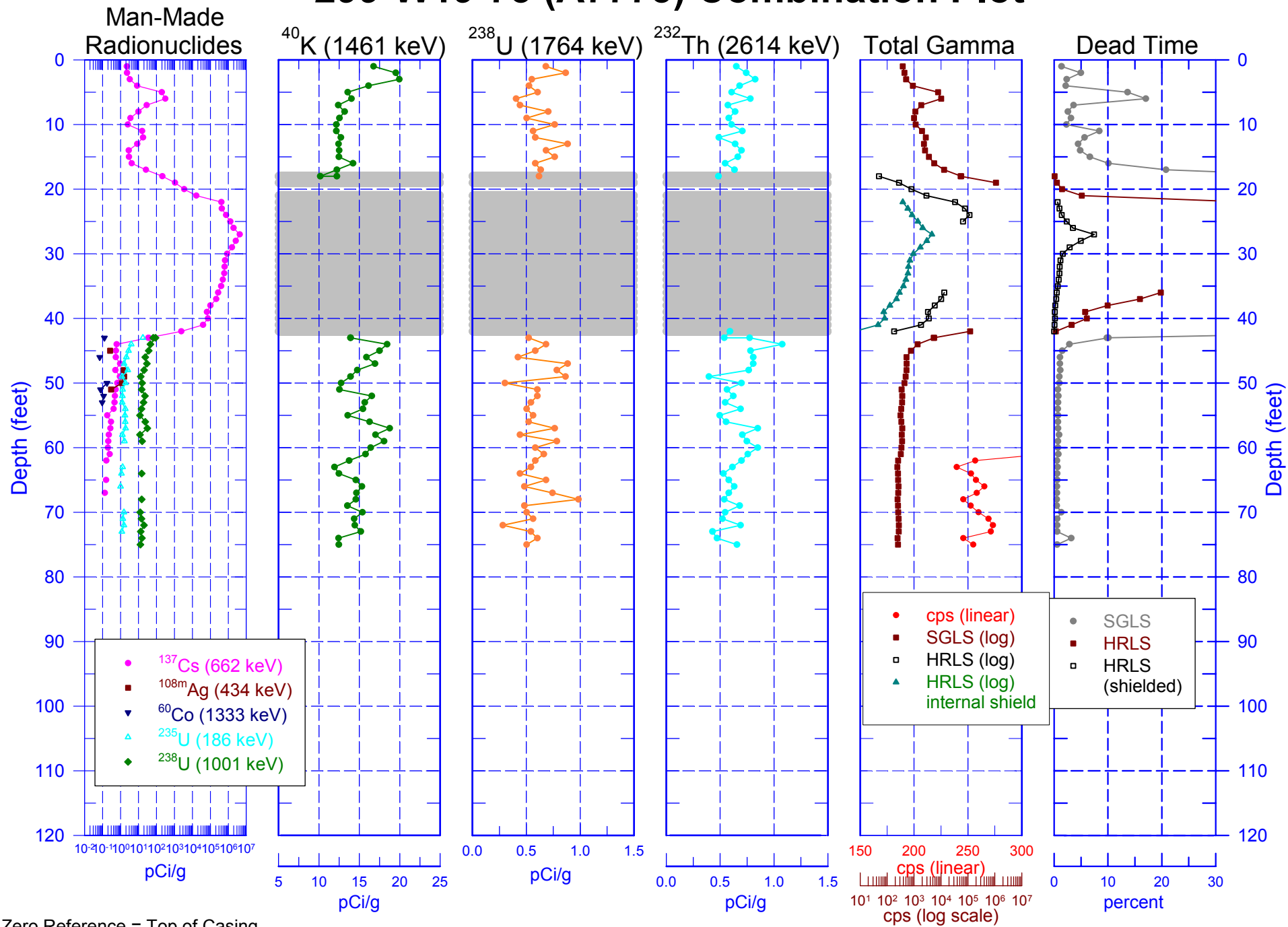
# 299-W19-73 (A7773)

## Natural Gamma Logs



Zero Reference = Top of Casing

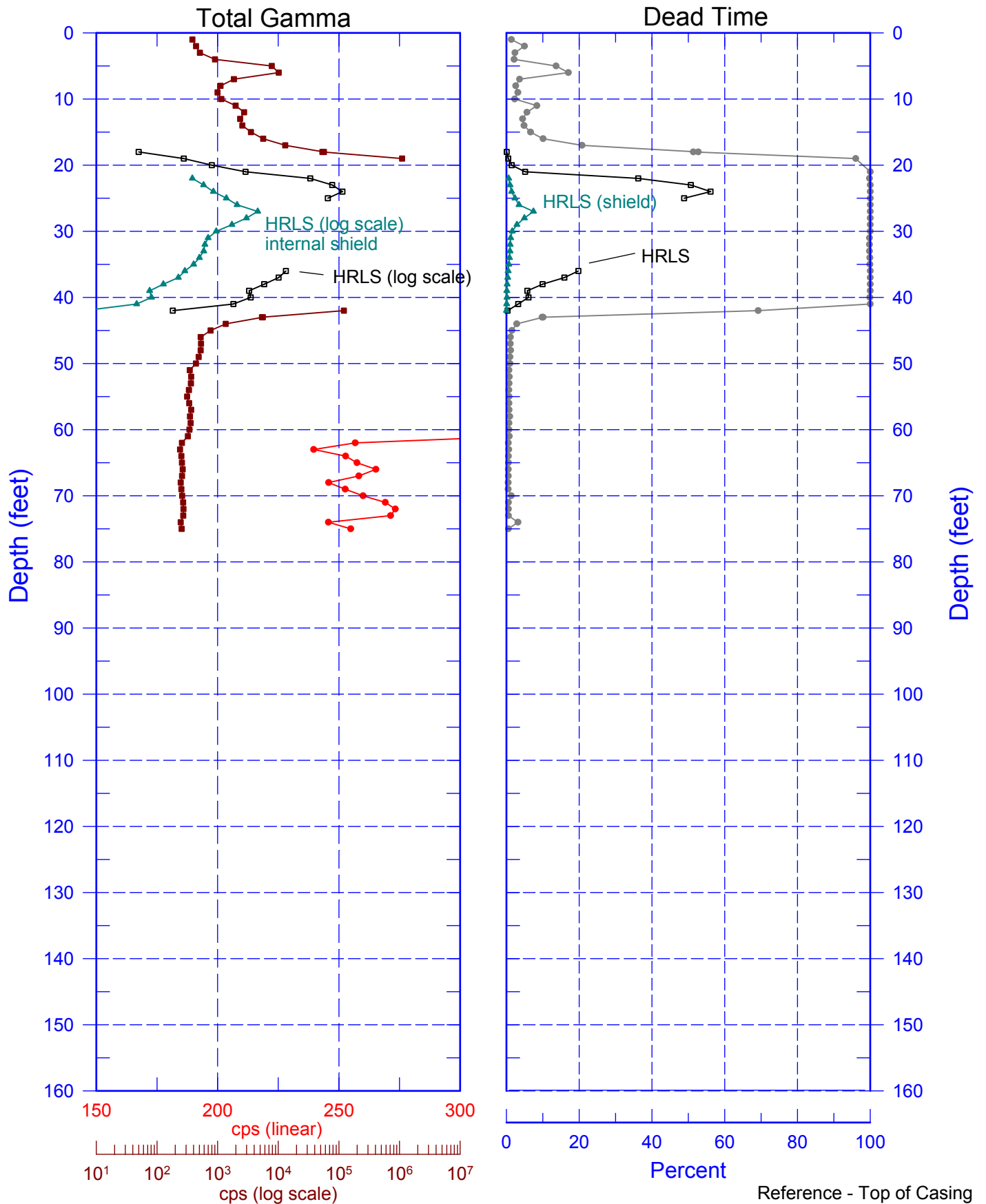
# 299-W19-73 (A7773) Combination Plot





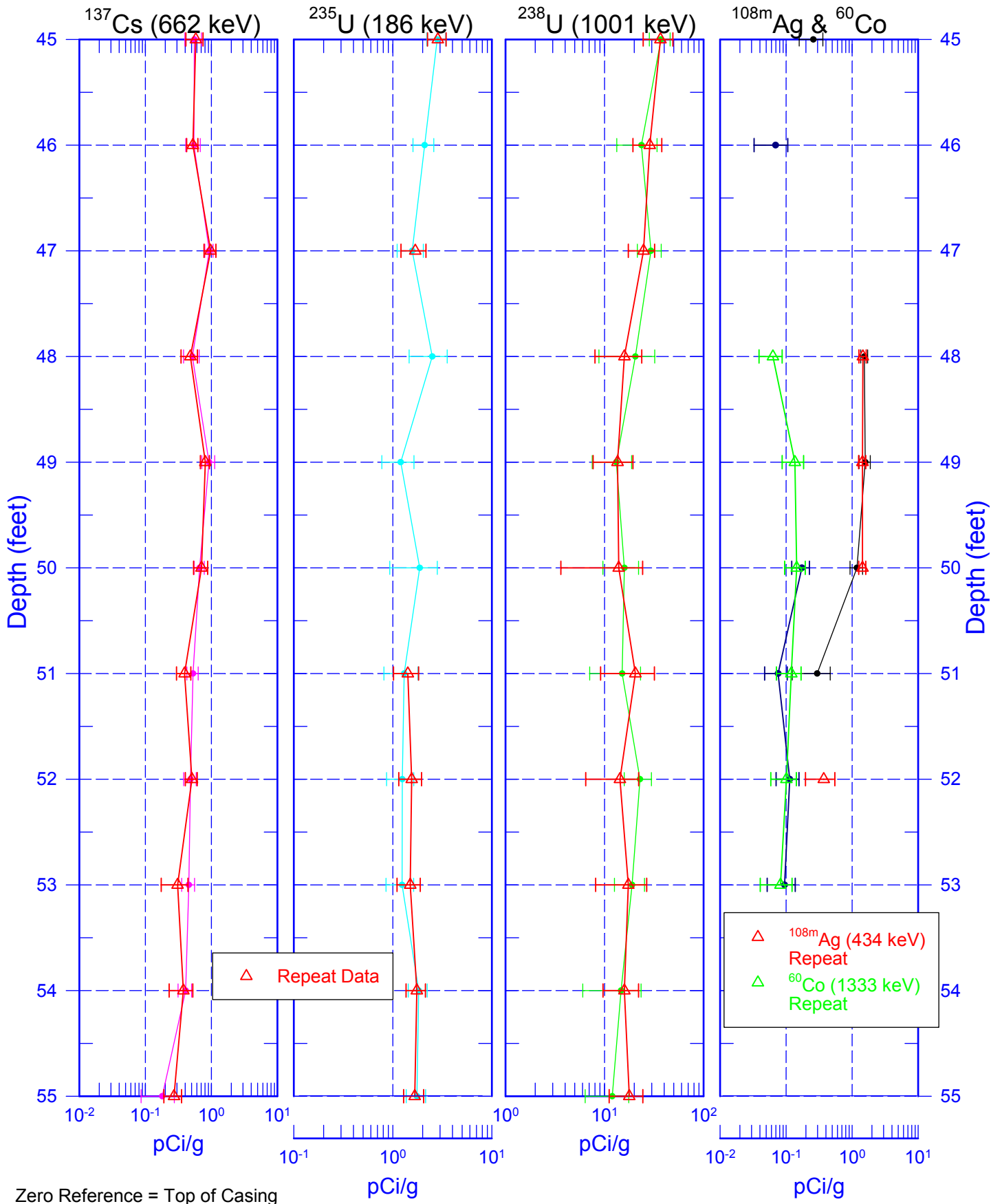
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## Total Gamma & Dead Time



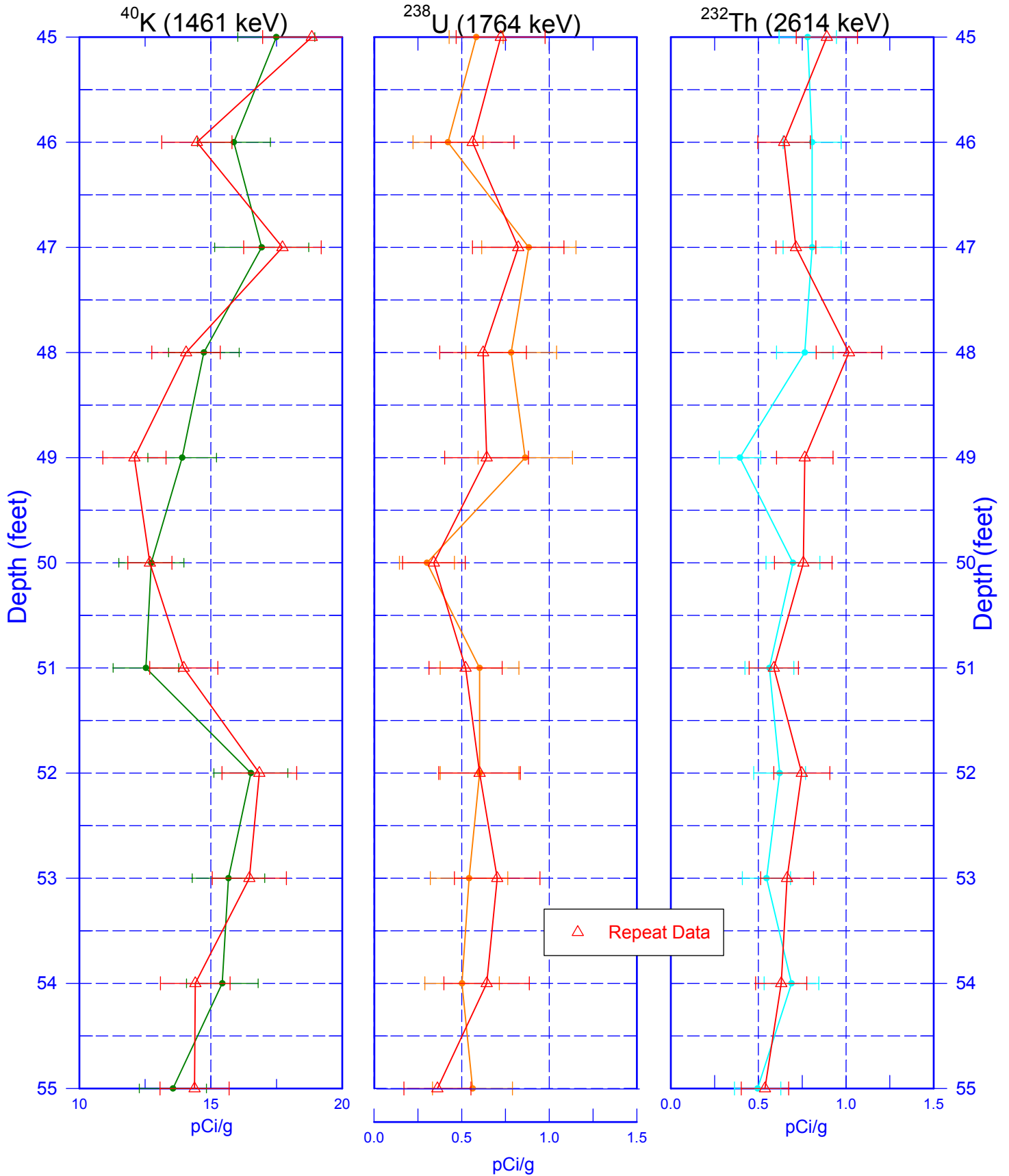
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## Man-Made Repeat Section



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## Repeat Section of Natural Gamma Logs



Zero Reference = Top of Casing